

## LIFE HISTORIES OF HONEYCREEPERS

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In the first volume of my work on the life histories of Central American birds (1954), I gave accounts of three species classified in the family Coerebidae, as the family was then understood. These were the Blue Honeycreeper (*Cyanerpes cyaneus*), the Bananaquit (*Coereba flaveola*), and the Slaty Flower-piercer (*Diglossa baritula*). After this book was written, I was able to return to studies of the Green Honeycreeper (*Chlorophanes spiza*) and the Turquoise Dacnis (*Dacnis cayana*) begun long ago, and I am presenting here the results of these observations. Since a quarter century has passed without any substantial addition to my knowledge of the Scarlet-thighed Dacnis (*D. venusta*), I am including a description of the only nest of this bird of restricted range of which I have information. Recent observations on the abundant and widespread Blue Honeycreeper are given to supplement the life history published in 1954. One other member of the family, the Shining Honeycreeper (*Cyanerpes lucidus*) occurs north of Darién, and although my observations on its habits are scanty, I am also presenting them to round out my accounts of the honeycreepers of continental Middle America.

## GREEN HONEYCREEPER

The Green Honeycreeper (*Chlorophanes spiza*) is about five inches in length and thus is one of the larger representatives of its family. The male is nearly everywhere bright, glossy green, with a bluish tinge in some lights. The top and sides of his head are black. His fairly long, sharp bill is bright yellow with a broad black band along the culmen. His eyes are red, and his legs and toes are gray. The female is much paler, more yellowish green, without black on her head. Her eyes are duller than the male's, and her bill is clouded with dusky.

The species ranges through the more humid lowlands from southern México to Bolivia and southwestern Brazil. In both northern and southern Central America, it is found from sea level up to 3000 feet or a little more. Rarely seen in the dark depths of unbroken forest, it frequents the treetops, the edges of the woodland, and clearings with scattered trees and shrubbery. Although a number of Green Honeycreepers may gather around a rich source of food, they are more solitary than gregarious and do not travel in flocks. Pairs may be seen through much of the year; but their breeding season is long, and I lack sufficient evidence to assert that these honeycreepers remain mated at all seasons, as do many tropical tanagers and finches.

This honeycreeper is rather ill-tempered. The first mention of the species which I find in my journals tells of a vicious and, as far as I could tell, wholly unprovoked attack which an adult male made on an immature Plain-colored Tanager (*Tangara inornata*) in the clearing beside the laboratory on Barro Colorado Island, Panamá Canal Zone, on March 25, 1935. The tanager was perching in a guava tree with several others of its kind when the honeycreeper darted at them, making all flee except the unfortunate tanager that was taken by surprise. The assailant pulled out some of the tanager's feathers, then attacked it from below, seizing one of its legs in his bill. Soon the victim was clinging to its perch by one leg while the honeycreeper hung from the other leg. The honeycreeper did not release his grasp until I threw a stick toward him. After his departure, the tanager regained its perch and sat as though dazed. As far as I could discover, the honeycreeper was not defending a nest, which might have accounted for the vigorous attack.

Many years later, while watching a variety of honeycreepers competing for the red arillate seeds of a *Clusia* tree beside my home in Costa Rica, I saw a Green Honey-

creeper seize the tip of a Blue Honeycreeper's wing. The latter hung below the assailant's bill with both wings stretched out. Soon it was released.

The male Green Honeycreeper not only seizes small birds of other kinds with his bill, but he likewise seizes his mate. At least three times, I have seen one take firm hold of a female's tail and hang on, while she tried hard to pull away. On these occasions the female would sometimes cry out. Twice the female was building when this happened. I have never seen a female honeycreeper use her bill in the same fashion as the male, nor have I ever known a small bird of any other species to seize other individuals as does the male Green Honeycreeper.

I have rarely met owls in Costa Rica, and I can recall only once when an owl was "mobbed" by a variety of small birds, as has so often been described in northern lands. On this occasion, the center of attraction was a Spectacled Owl (*Pulsatrix perspicillata*). It was resting on a slender branch high in the forest near our house. With its great head and massive form made still more impressive by puffed-out feathers, it seemed nearly as thick as it was long and appeared huge in comparison with the smaller birds that clustered around it. Some of the smaller birds were merely curious, but others protested its presence. Among the latter was a male Green Honeycreeper, in company with a pair of White-tailed Trogons (*Trogon viridis*), a Violaceous Trogon (*T. violaceus*), and hummingbirds of several kinds. The honeycreeper ventured closer to the impassive owl than did the larger trogons, but the tiny hummingbirds came closest of all.

#### FOOD

The Green Honeycreeper eats a variety of fruits and insects. Like other members of the family, it is fond of the bright red arils that surround the small seeds of *Clusia*, a genus of usually epiphytic trees and shrubs abundant in tropical America. When more succulent food is scarce, as often happens in the dry season, it breaks pieces from the long, finger-like, fruiting spikes of *Cecropia*, a swiftly growing tree of new clearings that is famous for the ants that inhabit its hollow stems and branches. In the Pacific lowlands of Costa Rica near the Golfo Dulce, a vine of *Marcgravia*, which had grown over a tall forest tree, attracted many of these honeycreepers in November. The long-stalked flowers of this liana are borne in a pendent whorl, beneath the center of which hangs a cluster of cup-like nectaries. Throughout the day, the honeycreepers came in numbers to cling to these cups and extract something from them. But the tree was so high that I could not learn whether they sipped the nectar, or caught insects attracted to it, or, which seemed more probable, took advantage of both of these sources of nourishment. Sometimes four or five of the green birds were present at once, and often one chased another. Among other visitors to the nectaries were many Scarlet-rumped Caciques (*Cacicus uropygialis*) and an occasional Blue-crowned Wood Nymph Hummingbird (*Thalurania colombica*), Golden-naped Woodpecker (*Tripsurus chrysauchen*), and wintering Baltimore Oriole (*Icterus galbula*).

I first saw a Green Honeycreeper eating banana on the feeding shelf beside my house on October 15, 1944, and in the succeeding 17 years these honeycreepers have been fairly regular visitors. Once eight were present at one time, either eating or awaiting their turn on the surrounding branches. Sometimes several share the board, but at other times they are less tolerant and one may drive away the others, regardless of sex. The attendance of these honeycreepers and other birds fluctuates greatly with the abundance or other foods in the neighborhood. Once, when we ran out of bananas and plantains, the honeycreepers sipped the juice from halved oranges that I placed on the board as a substitute. Green Honeycreepers also probe flowers, especially those of leguminous plants with clustered stamens (Mimoseae). This is discussed in more detail in the account of the Turquoise Dacnis on page 98.

## NUPTIAL FEEDING

While I stood in a flowering coffee plantation at the end of March, a female Green Honeycreeper flew into a bush in front of me. Suddenly a male of her kind dropped down from an avocado tree, alighted beside her, and seemed to give her something. The male immediately flew off, leaving the female to eat a small berry which evidently he had passed to her. On the morning of June 3 a male seemed to feed his mate in a tree in front of my window, but unfortunately both birds had their tails toward me and I could not see the food.

## ANTING

Three times I have seen a female Green Honeycreeper anting in the trees surrounding our house. On each occasion, she performed on a branch well above the ground. Holding her body upright and her tail pushed forward as far as the branch permitted it to go, she brought her wings forward until they touched in front of her breast, or even overlapped. Sometimes the ends of her longer wing feathers projected backward between her legs. She appeared to pluck from the tree objects too small for me to discern, and each time that she did this she then rubbed her sharp bill along her partly spread primaries, especially the outer ones. As far as I could see, her bill touched neither her tail nor her under tail-coverts, only her wings. Each session of anting lasted for several minutes, during which she applied her bill to her wings possibly a dozen times. I could not tell whether she afterward ate or discarded the unseen objects that she apparently rubbed over her wings. One session of anting took place on a dead stub of a guava tree, whence the honeycreeper seemed to pluck the small black ants that abound in decaying wood. The other two sessions were on the mossy limbs of a rose apple tree (*Eugenia Jambos*). All three sessions took place in the afternoon. All the birds which I have seen anting in the tropics have done so in trees, never on the ground, as frequently occurs in the North (Skutch, 1948).

## VOICE

The only note that I have heard from the Green Honeycreeper is a sharp monosyllable, a warbler-like *chip*. This call is much in evidence when a number of the honeycreepers are gathered around a source of food, and it seems that they are protesting each other's presence. If a male bird can sing, he is likely to do so while his mate builds, yet I have watched the construction of three nests without hearing a single tuneful sound from the closely attendant male. In one instance, both partners were silent; in another, the male voiced a few slight, sharp notes. Yet I hesitate to assert that the Green Honeycreeper is wholly devoid of song. Blue Honeycreepers have little songs, but one may spend years with them and never hear them sing.

## NEST BUILDING

In the valley of El General in southern Costa Rica, where the Green Honeycreepers are abundant up to at least 3000 feet above sea level, they have a long breeding season. My earliest date for building is April 19, 1945, and I have found no occupied nest after June. But breeding continues far longer than this, for I have seen parents feeding young as late as the beginning of November. The four nests which I have discovered were in trees growing in clearings near the forest, but I suspect that nests are more often placed in the woodland itself, where they escape detection. I have repeatedly seen females with nest material fly off toward the woods until I lost sight of them.

The four nests ranged in height from 10 to about 35 feet. The first that I found was the most exposed. It was in a *Pachira* tree beside a shaded stream flowing between pas-

tures and plantations, near second-growth woods. The nest was about 30 feet up, on a nearly horizontal branch about an inch thick, between two sharply ascending young leafy shoots. Well screened above by dense, newly expanded foliage, it was plainly visible from the ground. Two other nests were in the compact rounded crowns of trees standing in pastures. The first was in a copalchí (*Croton glabellus*); the second was in a muñeco (*Cordia*). These nests were placed within the clustered peripheral foliage, and the slight structures were so well concealed and resembled so much fallen leaves caught up in a crotch, that, although I suspected their presence, I could not find them until the building honeycreeper guided my eyes to them when she brought material. The fourth nest was 35 feet up, far out on a nodding spray of a big timber bamboo in sight of the window before which I write, but it was so inconspicuous that I did not suspect its presence until I saw the parents take food to the nestlings.

The nest is built by the female alone, and although her mate often accompanies her, he takes no part in the work. On April 19, 1945, I watched a dull green female search through the bushes beside a stream until she found some fine fibers, which she carried up to the site in the *Pachira* tree already described, thereby revealing to me the position of her newly begun structure. She attached the brown fibers among the few that she had already placed there, then flew off for more, leaving me elated to have found at long last a nest of this familiar bird.

It was then nearly nine o'clock in the morning. In the next hour, the honeycreeper brought material five times, and between 10:00 and 11:00 a.m. she did so nine times. On the following day, I watched for five hours. From 7:10 to 8:00 a.m. the honeycreeper did not appear, but between 8:00 and 10:00, and again from 1:30 to 3:10 p.m., she worked at her usual slow rate. In a total of six hours and 10 minutes of building, she brought material 33 times, and the greatest number of visits in a single hour was nine.

This honeycreeper brought materials of three kinds in no set order. I noticed cobweb in her bill 11 times, fibers 7 times, and big, dead leaves 4 times. On her other 11 visits, I failed to recognize what she brought. The brown, dead leaves, which were sometimes curled up and were sometimes nearly flat, were often nearly as large as the bird that carried them. She struggled hard to push and pull these leaves between the twigs and petioles of the nest tree and arrange them in the nest. She wiped the cobweb from her long, sharp bill onto the supporting twigs, now on one side of the branchlets and now on the other, and over the dead leaves and brown fibers that she had placed between them, thereby cementing the whole fabric firmly together.

Although the bright green male did not take an active share in building, he faithfully attended his partner. He escorted her to the nest tree on at least 15 of her 27 trips in the morning, but I saw him do so only once in the afternoon, when I watched the female make six visits to the nest. While she arranged the materials there, he rested on a certain slender branch a few yards away, sometimes preening his brilliant feathers. When she flew off, he hurried after her. Sometimes they went toward the house, probably to eat bananas and plantains at the feeding shelf. The only note that I heard from this male was a slight, sharp monosyllable.

By the afternoon of April 20, the nest resembled a small bunch of dead leaves caught up between the twigs. These leaves stood up around the sides of the structure, making it difficult to see the honeycreeper as she worked. Late on the morning of April 23, I saw her bring a whole sheaf of what appeared to be the fine secondary rachises of the compound leaves of *Mimosa myriadena*, a vine which climbs high into the trees at the forest's edge. The female spent a long time arranging this material, while her mate waited on a neighboring bough. From 9:45 to 10:25 she came only this once to her nest, which seemed to be nearly finished after four or five days of leisurely work.

At the second nest I watched, the female worked more rapidly. On the cool and drizzly morning of May 19, 1945, she brought contributions 11 times between 8:00 and 8:30, 7 times from 8:30 to 9:00, and 7 times from 9:00 to 9:30. Her material consisted of many small, dead leaves and a few billfuls of fibers. Her mate sometimes followed her back and forth. Once, as she was leaving the nest, he seized her tail in his bill and held on tightly, for a minute or more resisting all her efforts to escape him. In her attempt to break away, she pivoted around the slender twig to which she clung, pulling the male after her. It looked as though they were turning somersaults together. Finally, they fell to the ground still clutched together, and there at last they separated. This male neither worked nor sang.

The third nest was so surrounded by foliage that it was difficult to watch. From 7:00 to 8:00 a.m. on May 12, 1954, the female brought material five times, and in the following half-hour she did so only once. Her mate followed each time that she approached or left the nest, and I heard no sound from either of them. Green Honeycreepers appear to gather all their material from trees, and I have often watched them searching the branches for fibers or the roots of epiphytes.

When finished, the second nest was a shallow, open cup, measuring 3 inches in diameter by 2 inches in height. The hollow which contained the eggs was  $2\frac{1}{8}$  inches in diameter by  $\frac{3}{4}$  inch deep. The thick bottom was composed of dry leaves in many layers, intermixed with the fine, curved, minutely spiny secondary rachises of *Mimosa myriadena*. A few of the fine, tough fungal filaments known as "vegetable horsehair" were included in these layers. The lining was composed of the same brown rachises and decaying leaves, some of which had almost become lacy skeletons. The nest was fastened in a fork by means of cobweb. The largest leaf in the nest was  $3\frac{1}{2}$  inches long by  $1\frac{1}{2}$  inches broad. Many of the leaves were nearly 3 inches long by 1 inch in breadth. The rachises of mimosa were mostly from 2 to 3 inches long.

The third nest was less symmetrical, measuring  $2\frac{3}{4}$  by  $2\frac{1}{2}$  inches in diameter by 2 inches in height. The cavity was 2 by  $1\frac{3}{4}$  inches in diameter by 1 inch in depth. The outer wall was composed of small, dead leaves, mostly whole and between 1 and 3 inches in length. These leaves were held together by slender, dry inflorescence stalks, rachises, and tendrils. The inside of the nest was well lined with brown and black fungal strands, carefully coiled down.

#### THE EGGS

As far as I could learn, the female never began to incubate in the first nest. In the second nest, an egg was laid on May 23; with great difficulty I could see it in a mirror raised on a long pole. On the afternoon of the following day it rained, and the wet foliage clung so heavily around the nest that my mirror failed to reflect its contents. By May 25 this nest was empty. In the third nest, which was only 10 feet high but difficult to see because of densely clustering foliage which I did not wish to disturb, eggs were laid on May 14 and 15. The two eggs which formed the full set were white, with a wreath of brown spots on the large end.

#### INCUBATION

This third nest was situated in the spreading crown of a low muñeco tree growing on the steep hillside behind our house. From the outside of the crown of the tree, the nest was wholly invisible; but when I sat beneath the tree, on the uphill side of the trunk, I could see the nest imperfectly by looking up through the leafless inner portions of the branches. The steepness of the slope was so great that I was almost level with the nest, and to set a blind here was impracticable; yet the incubating honeycreeper appeared indifferent to my presence. I watched her from 11:50 a.m. to 5:05 p.m. on May

19, 1954, and from 5:23 to 11:12 on the sunny morning of the following day. On this day, the female became active early, leaving her nest in the dim light at 5:36 a.m. On the afternoon of May 19, she returned from a recess at 3:38 and was still on her nest at 5:05, when I left in the rain which then began and continued into the night. It is improbable that the female left the nest again in the wet evening. Thus, counting the two days as one, her active period lasted only about 10 hours, during which she took eight completed sessions which ranged from 32 to 149 minutes and averaged 54.9 minutes. Her nine recesses ranged from 6 to 20 minutes and averaged 12.2 minutes. Calculating by these averages, according to the formula which I have given elsewhere (1954: 15), the female's constancy in incubation was 81.8 per cent. Considering her small size and the shortness of her active day, she was surprisingly assiduous.

Whenever the female honeycreeper returned from a recess, I first became aware of her after she had passed through the foliage which formed a dense, umbrella-shaped canopy at the periphery of the tree's spreading crown. Here I could see the female well from my post within the canopy of the tree, but she would have been invisible to one watching the tree from the outside. After her sudden appearance within my restricted field of view, she advanced toward her nest by several successive flights, after each of which she paused to scrutinize her surroundings. Finally she settled on the nest, where I could see little of her. I noticed her mate in the nest tree only once. This was before sunrise, when he followed her on her return from the day's first outing. On this occasion, he appeared for a short while on the side of the crown opposite the nest but flew away as she advanced toward the nest. Both of the honeycreepers were silent.

At this nest, one egg had hatched by 7:00 a.m. on May 27. At 3:45 p.m. there was still only one nestling, but by 7:00 a.m. on May 28 there were two nestlings. Since the last egg had been laid before 10 a.m. on May 15, the period of incubation appeared to be about 13 days. The female had evidently begun to incubate after laying her first egg.

#### THE YOUNG

When the newly hatched honeycreepers gaped toward the mirror which I held above them, I could see that the insides of their mouths were red. While I looked into the nest with my mirror on May 31, the female approached with food in her bill, accompanied by her mate, in whose bill I could detect nothing. The male protested with weak *chirp*'s, the first notes which I heard from him.

On the following morning, I started before sunrise to watch the nest. As it grew lighter, I failed to see it, so I left my observation post to investigate. I found the nest hanging amid the foliage below its original position, but the nestlings had vanished. Although I had refrained from setting up a ladder to examine the nest's contents and had not removed a single leaf for better visibility, some predator had found and pillaged this tiny, excellently concealed structure, which the attendant honeycreeper had always approached with the utmost circumspection.

At the nest which I found in the bamboo two years later, twice I saw the male bring food, in mid-June. This nest was so difficult to watch that I did not try to learn how important a part the male took in attending the unseen nestlings. Two full-grown young that came to my feeder on November 2, 1951, were given bits of plantain by both parents, and they could also feed themselves. But I saw only the female feed two fledglings which she brought to the shelf from September 25 to October 5 of 1959. At the later date the fledglings could help themselves a little. All these fledglings resembled the female in plumage, but they were a duller green.

From September until the year's end, I have occasionally seen male Green Honeycreepers in transitional plumage. Apparently they were young birds acquiring adult

plumage. Males in full breeding plumage are present throughout the year, and I have seen nothing to suggest that they go into "eclipse" after the breeding season, in the manner of the male Blue Honeycreepers.

#### TURQUOISE DACNIS

The Turquoise Dacnis (*Dacnis cayana*) is about four and a half inches long. The male is largely blue, varying from cerulean or turquoise to ultramarine according to the race, with extensive areas of black covering the lores, back, throat, tail, and much of the wings. The wing coverts are tipped and margined with blue. The female is nearly everywhere yellowish grass green, tinged with blue on the head. Her delicately blended tints are scarcely less beautiful than the rich coloring of her mate. In both sexes, the eyes are dark; the bill is blackish, becoming flesh-color toward the base of the lower mandible; and the legs and toes are pale flesh-color. This species has been called "Blue Dacnis" in recent lists of Central American birds, but it has long appeared under the name "Turquoise Dacnis" in works on South American ornithology. Thus it seems best to use the earlier name, which was applied to the nominate race, even though other races are of slightly different shades of blue.

The Turquoise Dacnis is found in the more humid lowlands from Nicaragua to Bolivia, southern Brazil, and the Guianas. In Costa Rica it does not range as far into the highlands as the other thermophilous honeycreepers. On our farm at about 2500 feet in the valley of El General, it is not uncommon. But in the year and a half which I spent at Rivas, 500 feet higher in the same valley, I did not see it once; and I have no record of its occurrence at 3000 feet above sea level in other parts of the country. This honeycreeper wanders through the sunlit crowns of the forest trees and into clearings with scattered trees and bushes, where it descends nearer the ground. The largest flock of which I have a record consisted of about six birds of both sexes. In early January this flock foraged in an orange tree in the narrow clearing in the forest on Barro Colorado Island. Near the upper limit of the bird's range in El General, I scarcely ever find more than three or four individuals together. Males are evidently more numerous than females, for I have not infrequently seen parties consisting of two or three males in full or nearly full nuptial plumage and only one female. Sometimes I have seen two or three males without a female. As told beyond, two males may even attend a nest. In southern Brazil, Mitchell (1957:195-196) usually found the Turquoise Dacnis with the mixed flocks of tanagers and other birds that wandered through the parks and wooded hills in the vicinity of Rio de Janeiro.

#### FOOD

Sometimes the Turquoise Dacnis hunts insects amid the foliage, much in the manner of a wood warbler. Like other honeycreepers, it is fond of the soft red arils which surround the small seeds of *Clusia*, and it also eats berries of various kinds. Once, in October, I watched two males visiting the flowers of some tall, spreading bushes of *Calliandra similis*, in an open thicket beside a river. They were in company with a small flock consisting of Blue Honeycreepers, a male Green Honeycreeper, and a few Bananaquits. All fed in the same way, perching on a twig just behind the flowers and bending over to push their slender bills deep into the clusters of long, red stamens, to extract either the nectar or small insects attracted to it, or both. All fed together amicably, except the Green Honeycreeper, which, after he had satisfied his own appetite, spent his time darting at the other birds and trying to drive them away.

I had been placing bananas on my feeding shelf for several years, and it had already attracted 20 kinds of birds including four of the Coerebidae, before I saw a dacnis take

an interest in it. Early in January of 1946, a male flitted around above the board, looking down as though eager for the fruit, yet fearful of alighting on the strange object. Once he plucked up courage to descend to it, but he had hardly touched it before he flitted away, without having tasted a banana. On the following afternoon, he returned and again hovered about the board, watching the other birds eat. So long as larger birds were present, he would not go near the table, but at last, seizing a moment when no large oriole or tanager was there, he hesitantly hopped to the center and tasted the ripe plantain which was the day's attraction. Finding it good, he returned again and again, ate freely, and soon had acquired so much confidence that he threatened a Blue Honeycreeper that pressed him too closely. After a while, a second dacnis came with the first, a male with a tinge of green on his flanks that revealed his immaturity. Soon a female came, accompanied by the two males. All were on the board at once, eating freely, along with honeycreepers of different species and a variety of other birds.

During the succeeding 15 years, dacnises have been irregular attendants at the feeding tray, coming frequently at certain seasons, often in trios and foursomes, but at other seasons remaining away for weeks together.

In Brazil, Mitchell (1957:23, 196) found Turquoise Dacnises catching winged termites in the air, in company with a number of birds of other families. The dacnises often foraged among the ample inflorescences of mango trees.

#### VOICE

I have never heard a Turquoise Dacnis sing. A male, accompanying his building mate, occasionally voiced a slight, weak monosyllable. Once when he came without his partner to examine her work he was more vocal; perching beside the nest, he repeated his lisping notes over and over for about a minute. At another nest, the parents protested with slight, high notes when I viewed their nestling in a mirror. Aside from these occasions, I have rarely heard a sound from these silent birds.

Mitchell (1957:196) found males "posturing in a manner reminiscent of Cowbirds [*Molothrus ater*]," that is, "standing tall and bowing, and moving restlessly from branch to branch."

#### NEST BUILDING

The only nests of this honeycreeper that I have seen were two which were built beside our house in El General in May. In mid-May of 1945, a pair began to frequent a young burio tree (*Heliocarpus*) in front of the house. At intervals they would disappear into the clusters of foliage that terminated the long, slender, ascending branches near the top of the crown. They seemed to be hunting a nest site, and the male engaged in the search as well as his mate. After this had continued for a few days, the female came, on the afternoon of May 21, with fine fibrous material, which she fastened among the clustered leaves at the end of a thin branch, about 25 feet above the ground. She soon had the first outline of a nest, a frail fabric of almost cobweb-like delicacy. On the following day, she continued to add to the nest at long intervals, her mate dutifully following her and sometimes going to the nest site, but bringing nothing.

On May 23, I devoted six hours to watching this nest through an open window. The female continued to build at a very leisurely rate. In successive hours from 7:00 a.m. to 1:00 p.m., she brought material as follows: 2, 5, 5, 3, 4, and 5 times. Twenty-four visits to the nest in six hours is slow building, but it is noteworthy that this dacnis worked at about the same rate through the late morning and early afternoon, instead of building very actively in the early morning and then doing little, in the manner of many birds. At one o'clock it began to rain and I discontinued observations. On other days, however,



I saw the dacnis bring material to her nest during pauses in the afternoon showers which were so prevalent at this season.

The material most often brought was finely shredded, light-colored bast fibers, possibly pulled from a dead branch of some other burío tree or from a *Cordia* or a *Goethalsia* growing at a distance. Sometimes the female came with a single strand; sometimes she had a liberal skein of fibers doubled up in her bill. Less frequently she brought wefts of cobweb or cocoon silk, or sheaves of slender, curving, brown rachises, probably secondary rachises of *Mimosa myriadena*. Arranging these materials in the cup-like nest was a lengthy and strenuous task for so small a bird. Nearly always she continued this work for well over a minute; often she worked for two minutes or more, and twice I saw her work on the nest for over three minutes. With feet and bill, she pushed and pulled the fibrous materials of her nest into place. To shape the thin, tough fabric, she used her whole body and often turned around. Her task completed, she dropped below the nest and flew off toward the forest to the south, her mate following.

Although the male dacnis never brought anything and took no part in shaping the nest, he often followed the female to and from the burío tree. On 14 of her 24 visits I saw him there, and it is possible that he came a few times more but rested where his small body was screened from me by the heart-shaped leaves far larger than himself. While his mate worked at the nest, he rested on a neighboring bough, never singing, but on rare occasions voicing slight notes, as already recorded. He also guarded the nest tree, with fine spirit driving off intruders bigger than himself. Once he chased away a Golden-masked Tanager (*Tangara larvata*). He followed a brilliant male Scarlet-thighed Dacnis into the burío tree and drove him out. Once the building female flew at and put to flight a relatively huge female Song Tanager (*Ramphocelus passerinii costaricensis*) which had alighted near the nest while she was shaping it.

Once, after the female dacnis had settled in the nest, her mate, which had followed her into the tree, approached and passed something to her. I could not distinguish the object, but probably it was a small bit of food.

Before this nest was finished, the leaves that clustered around it began to fall, leaving it exposed, and it was abandoned. Fourteen years later, on May 12, 1959, I found my second nest of the Turquoise Dacnis. It was in a guava tree about 100 feet distant from the spot where the burío tree had grown swiftly and died. This nest was 18 feet above the ground, far out on a slender, horizontal branch, where the clustered foliage made it difficult to see. After the nestling's departure, I cut down the nest for examination. It was a deep cup, almost a pouch, suspended between two short, leafy, lateral twigs, which were two inches apart and nearly horizontal. The body or compact part of the nest was not in contact with the supporting twiglets but was suspended below them by a loose, open network. One whole side was sustained by a single, cable-like strand of twisted fibers,  $1\frac{1}{2}$  inches in length. From the highest point of suspension to its rounded bottom, the nest measured  $3\frac{1}{2}$  inches, and its greatest outside diameter was  $2\frac{3}{4}$  by 2 inches. The interior measurements of the compact cup were  $1\frac{3}{4}$  by  $1\frac{1}{4}$  inches in diameter by somewhat under an inch in depth. The body of the nest was composed of fine bast fibers and soft seed down, compactly matted. The suspending superstructure was made of well-twisted bast fibers and a number of secondary rachises of *Mimosa myriadena*. There was scarcely any cobweb used in this nest.

I wonder whether this nest was typical. The one which I had watched the female build did not seem to be as deep as this when completed. If a shallower, vireo-like nest, insecurely attached by its rim, sank down in the course of construction, it might assume the form of this one. Although, when I viewed the nest above me in the guava tree, the deep pouch appeared so insecurely fastened that it was in danger of breaking away, when

I took it in hand it seemed strong enough. The domed nest ascribed to this species by Belcher and Smooker (1937:519) evidently belonged to some other bird.

#### THE EGGS

The nest in the guava tree contained two well-incubated eggs when found on May 12. Seen in a mirror raised on a stick while I stood on a ladder, they were white or whitish with dark markings.

#### INCUBATION

After many trials, I found a spot on the ground from which I could glimpse the incubating honeycreeper's bluish head, with a white guava blossom beside it. On May 13, I watched from 5:45 to 11:10 a.m. and from 11:30 a.m. to 2:45 p.m. Next day at 5:43 a.m. I resumed my watch and continued until 10:58. In nearly 14 hours of watching, I timed 20 completed sessions of the female, which ranged from 11 to 55 minutes and averaged 23.6 minutes. Her 21 recesses varied from 6 to 18 minutes and averaged 11.7 minutes. She incubated for 65.7 per cent of the time. Omitted from this record is a session which began at 1:44 p.m., a few minutes before a shower fell. After 20 minutes it stopped, but at 2:45 the rain began again and continued until nightfall. Apparently the dactylis was still in her nest at 2:45 p.m., an hour after her return, but the foliage, sagging with the weight of raindrops, now screened her completely from my view and it was useless to watch longer.

Although the male did not incubate, he sometimes accompanied his mate when she returned to her eggs, or else he came while she was sitting and she flew off with him. Twice each morning he brought food to the nest. On the first morning that I watched, he gave both billfuls to his incubating partner. Early on the second morning, the female jumped from the nest as the male approached with something red in his bill. He went to the nest and lowered his head into it. When I could again see his bill, it was empty. The male flew off and his mate resumed incubation. Later the male seemed to feed the sitting female, but I did not see this clearly. Early in the afternoon, while the female was absent, the male came with a billful of food, lowered his head into the nest, and appeared to offer it to the eggs—a case of anticipatory food bringing. As he was leaving with the food still in his bill, his mate arrived, whereupon he turned back and apparently fed her, but the foliage prevented a clear view of this transaction. Once, when the male fed his mate on the nest, a second male in full breeding plumage perched nearby. They showed no antagonism toward each other and went separate ways.

Despite her height above the ground and excellent concealment amid the foliage, the female was very shy, and would leave her nest if a human or even a horse walked past some yards away. The female was very sensitive to heat; whenever a spot of sunshine found its way through the foliage and fell on her, she sat restlessly and panted. Once she uttered a few high, weak notes just before she flew from the nest. I heard no sound from the males.

#### THE NESTLINGS

When I raised my mirror above the nest soon after noon on May 16, I saw that an egg had hatched. While the mirror, attached to a long stick, was still over the nest, the female arrived with two adult males, and all flew around protesting with slight, high notes. On the following day two males came with the female while I was looking into the nest. Only one of the two eggs hatched. The interior of the nestling's mouth was red.

It soon became evident that this nestling had three attendants, the female parent and two males. Since the latter were indistinguishable, I could not learn whether they

took approximately equal shares in feeding the nestling. On three occasions on the eighth day after the nestling hatched, one male fed the nestling almost immediately after the other had done so. The same thing happened three times on the following day.

Was this a case of polyandry, or was one of the males an unmated helper? I am inclined toward the second interpretation, because most of the time the female came and went with a single male which was evidently her mate. Moreover, I never had both males in view early in the morning. My earliest record of the presence of both males is 8:45 a.m., on a day before the egg hatched. I did not see both males together with food until 9:00 a.m. or later. Of course, the two males might have come at different times early in the day, in which case I should not have known that both were in attendance. But if both were bringing food throughout the morning, why should their visits not sometimes coincide then as well as later in the day? It seemed that one of the males did not begin to feed the nestling until his own hunger had been satisfied, after which he chose this activity to occupy his vacant time. A parent would hardly behave this way, but helpers are often more erratic in their attendance at a nest.

One male sometimes chased the other mildly. It was impossible to learn whether the same individual always took the offensive, although this is probable. In any event, their antagonism was not serious, and one day both males were at the nest together, with food, twice within 12 minutes. Sometimes, during the middle of the day, both males accompanied the female to the neighboring forest.

Frequently the attendants came with bright red food, which sometimes could be seen in their bills and formed a striking contrast with the blue or green bird that held it. These small red objects were evidently the arillate seeds of *Clusia*, of which honeycreepers are exceedingly fond. Rarely I detected a small black berry in the attendant's bill, and there were other items which I could not identify. Much of the nestling's food was brought in the adult's mouth or throat, and apparently it was held in the bill only after these interior spaces had been filled. Even the red seeds were sometimes carried inside the bill and could not be seen until the attendant produced them at the nest. As far as I saw, each attendant always gave the nestling the food brought for it. If the female happened to be brooding when a male arrived with food, she did not take it from him for transfer to the nestling beneath her. At this time she usually left the nest. Sometimes she resumed brooding as soon as the male had finished feeding the nestling. Occasionally, if the female failed to move aside to permit the male to reach the nestling, he carried away what he had brought. Rarely the male fed the nestling while the female remained on the nest, rising up to expose it. Considering that at least one of the males had earlier fed the female while she incubated, this failure to pass to her the food intended for the young was surprising.

TABLE 1  
FEEDING AND BROODING OF A NESTLING TURQUOISE DACNIS

Age in days	Hours watched	Feedings			Total	Minutes brooded
		Female	Two males			
1	1	1	1	2	35	
2	4	6	4	10	116+	
6	4	7	10	17	71+	
8	3	11	18	29	27	
9	3	14	15	29	4	
10	4	12	13	25	17	
	—	—	—	—		
Totals	19	51	61	112		

The number of meals received by the single nestling in 19 hours of observation is given in table 1. The rate of feeding varied from  $2\frac{1}{2}$  meals per hour when the nestling was two days old to nearly 10 meals per hour on the eighth and ninth days after it hatched. On the tenth day the rate of feeding dropped to about six times per hour. It is noteworthy that the female fed the nestling 51 times, and the two males together fed the nestling only 61 times.

Only the female brooded the nestling. The total time which she covered it during the observation periods is given in the sixth column of table 1, but unfortunately the records for the second and sixth days after the nestling hatched are imperfect. Once on each of these days I missed a departure of the female. When the nestling was one day old, the longest interval of brooding during an hour's watch was 27 minutes. When two days old, the nestling was brooded once for 28 minutes and three times for 22 minutes, in addition to some shorter intervals. When the nestling was six days old, the longest session of brooding that I recorded in four hours of watching was 23 minutes, and the next longest was 19 minutes. On the eighth day after the nestling hatched, the longest interval of brooding was 14 minutes. When the nestling was nine days old, it was brooded for only two intervals, one of three minutes and one of one minute, between 8:55 and 10:55 a.m., and was not brooded at all in the hour from 2:12 to 3:12 p.m., after the termination of a hard rain. On the following day, the ten-day-old nestling was brooded three times, for eight, seven, and two minutes, between 5:45 and 9:45 a.m. The morning was slightly overcast, and although the nestling's plumage was expanding, there was still much bare skin on its upper parts.

As has already been mentioned, when a male came with food while the female was brooding, she did not take it from him for transfer to the nestling but usually left the nest so that he could deliver what he had brought. On one occasion, the female jumped from the nest to permit a male to feed, resumed brooding, then almost at once left the nest to allow the second male to feed. After the departure of the second male, she settled down to brood again. But at another time, the female remained in the nest, with her head lowered and her tail in the air, while a male fed the chick.

Since I could not reach the nest but only examined it with a mirror, I could not follow in detail the nestling's development. At the age of eight days the nestling was in pin-feathers, and two days later its plumage was expanding, although there was still much bare skin on its upper parts. While I was inspecting the nest with the mirror at noon on May 28, the parents arrived and raised their weak calls of alarm. This caused the 12-day-old nestling to flutter to the ground, where without much difficulty I caught it, while its mother and the two males flew around me. The nestling was now fully feathered. Its upper parts, including the hindneck, back, rump, and upper tail-coverts, were fairly bright green. Its crown was bluish, but the feathers there and on the forehead were still largely ensheathed. The lesser coverts of the wings were dusky; the middle coverts dusky with broad green margins; the primaries and primary coverts dusky; and the secondaries dusky with narrow green outer margins. The nestling's underparts were pale yellow, tinged with olive on the breast, sides, and flanks, brighter on the middle of the abdomen. Its bill was dark and its legs and toes pale flesh-color, with blackish toenails.

During the following night, I kept the fledgling in the house for safety and placed it in a bush near its nest at dawn. By 11 o'clock it had vanished, but its attendants were flying around with food in their bills and I inferred that the nestling was hiding not far away. If it had not been frightened from the nest, it would probably have remained at least until the following day, or until it was 13 days old.

At the end of June, 1958, a fledgling Turquoise Dacnis appeared at the feeding shelf

with its parents and called imperiously from a branch above the board while they carried billfuls of fruit up to it. This young bird was attended chiefly by the male parent, and the female only rarely came with it. The fledgling and the male continued to visit the table into July, at which time a female dacnis sometimes came with a young bird whom she fed. Once, when the male and female were present together, there were two fledglings on the feeding board. If the adults were mates, as seemed probable, they had apparently divided the brood between them, each taking charge of a single young dacnis.

The breeding season of the Turquoise Dacnis is long, and at the end of October, 1946, a female brought a full-grown young bird to the feeder, giving it banana which she carried up while it waited, clamoring, on a bough above the table. By November 12 this young dacnis was helping itself, although it still begged for and received mouthfuls from the female. No male appeared with this fledgling.

I have seen males in full nuptial plumage throughout the year, and I doubt that they go into eclipse after the breeding season. It seems significant that both this species and the Green Honeycreeper, of which the adult males apparently wear the same colors at all times, have been seen with dependent young until November, whereas the more abundant Blue Honeycreeper, which does go into eclipse, has not been seen feeding young after early August.

#### SCARLET-THIGHED DACNIS

The Scarlet-thighed Dacnis (*Dacnis venusta*) is a strikingly colored honeycreeper about four and a half inches in length. In the male, the forehead, lores, orbital region, cheeks, and all the underparts except the bright scarlet thighs, are greenish black. The crown, posterior parts of the head, back, shoulders, and rump are turquoise blue. The wings, tail, and longer upper tail-coverts are black. The eyes are red; the bill is black; and the legs are blackish. The far duller female is greenish and olive, tinged with blue, on the head and upper parts; below she is grayish, becoming buffy on the abdomen and crissum. Her thighs are tinged with red.

The Scarlet-thighed Dacnis ranges from Costa Rica to Ecuador. In the former country, it is found at greater elevations than any other honeycreeper except the Slaty Flower-piercer of the highlands; from both coasts it extends upward to at least 4500 feet, at which altitude I have occasionally seen it near Cartago. It travels in loose flocks, although single individuals are often encountered. I have most frequently noticed this dacnis along the edges of heavy forest, but it may venture far from the woodland in search of food. In the valley of El General, I found it more abundant at Rivas, around 3000 feet, than at Quizarrá, some 500 feet lower. At Quizarrá I noticed it only occasionally from 1941 to 1949. In July of the later year it suddenly became abundant, and I saw flocks of this dacnis consisting of adults of both sexes, with at least one young bird still being fed by a female parent. I saw these flocks repeatedly, both in the forest and in the neighboring clearings. In August they left us, and in the succeeding 12 years I have seen no more Scarlet-thighed Dacnises in the vicinity of Quizarrá. Possibly the shrinkage of the forest is responsible for their failure to return. In the northeastern lowlands of Costa Rica, Slud (1960:109) found this dacnis only in the second half of the year.

#### Food

The favorite food of this honeycreeper seems to be the small black or blue berries of *Miconia* and other shrubs and low trees of the melastome family. The flocks which visited my farm in 1949 were feeding chiefly on these berries, which were then very abundant. Likewise, the small flock which I saw in mid-September, 1938, on a coffee

plantation near Cartago, at a point far from forest, was feasting on the little black berries of the "lengua de vaca," a small melastomaceous tree. The Scarlet-thighed Dacnis also eats the tiny, shining, black seeds of *Xanthoxylum*, apparently for the abundant oil in the soft outer coat, within which is a rough, bony layer which should preserve the embryo from digestion while it passes through the bird's alimentary tract. While I lived in Rivas, Blue Honeycreepers came in numbers to eat these seeds from a tree that grew beside my cabin, and sometimes a few Scarlet-thighed Dacnises accompanied them.

#### VOICE

Although I have seen far less of the Scarlet-thighed Dacnis than of the Turquoise Dacnis and the Green Honeycreeper, I have no reason to suppose that it is more vocal. My notebooks contain only one reference to the voice of adults. A female defending her young uttered a low, nasal cry.

#### NESTING

On May 9, 1936, I sat in a blind watching a nest of a Song Tanager in a bushy pasture at Rivas. Behind me stood a muñeco tree about 60 feet high, with a full, compact crown. From this umbrageous tree there issued at intervals the loud, shrill hunger cries of young birds. When I had finished watching the tanagers, I examined the crown of the tree from every angle, but I could not discover a nest or fledglings. Four days later the cries were louder and more imperious, carrying to my cabin 60 yards away. Another scrutiny of the tree disclosed only a nest of the Yellow-bellied Elaenia (*Elaenia flavogaster*), and it held only eggs. But a pair of Scarlet-thighed Dacnises which frequented the tree behaved as though they were parents, and this incited me to continue the search. The following morning I scrambled into the tree a second time and for about an hour scrutinized the foliage, from every angle and from every limb that would safely sustain me, but without success. At length the unknown nestlings became very hungry and began to call despite my nearness to them. Guided largely by their voices, I finally glimpsed something which appeared to be a nest, well hidden amid the dense foliage of the tree and of a parasitic *Struthanthus* vine which burdened its boughs. The nest, if such it was, had been built too far out from the trunk to be reached, and the foliage around it formed such a heavy screen that I could not see its contents even with the aid of a mirror tied to the end of a slender cane. I decided to leave the nest undisturbed until its occupants flew and then cut down the branch which supported it.

That afternoon one of the young honeycreepers left the nest. Perhaps its departure had been hastened by my excursion into the tree, but it could fly well, and I heard its shrill hunger calls emanating from the top of an avocado tree nearly 200 feet from the nest. Later I watched it fly 100 feet from a neighboring tree back to the muñeco tree, followed by a male Scarlet-thighed Dacnis.

Next morning I watched the muñeco to learn what I could of the habits of this little-known bird. One fledgling was perching in the treetop, and at least one more, to judge by the sounds I heard, remained in or near the nest. The female frequently came with food, which she carried in her bill, but she was too high for me to identify what she held. The male appeared only once, and I could detect nothing in his bill. On the preceding day, however, while I was searching for the nest, the male had carried what appeared to be an insect. Evidently he brought a little food to his family, but he left the brunt of their care to his mate. The female was over-zealous in the defense of her young and repeatedly flew angrily toward her larger neighbors, the harmless Yellow-bellied Elaenias. When a relatively huge Gray's Thrush (*Turdus grayi*) alighted in the muñeco tree, she darted toward it with a low, nasal cry and put it to flight.

After the family of dacnises had wandered away, I took down the branch that supported the nest, extricating it from the tangle of wiry parasitic vines. The exceedingly slight, frail nest was an open bowl, scarcely more than a hammock, supported between two parallel slender branchlets. It was so shallow that I marvelled that it could hold eggs in the wind-tossed crown of the tree, 50 feet above the ground. In internal diameter the nest measured 2 by 2½ inches; in depth, ¾ inch. It was composed of rather coarse, wiry materials, such as rootlets (doubtless from aerial plants), tendrils, and the slender rachises of ferns. The thin fabric was completely covered on the lower side by green, living pieces of the fern *Nephrolepis pendula*, some of them 4 inches long by 1¼ inches broad and containing many pinnae. The pieces of fern were held in place by the outermost strands of the nest, above which they had been laid. Cobweb had been used to fasten the nest's rim to the supporting twigs.

When the nest was viewed from below, the green covering of its lower surface blended with the green foliage that sheltered and screened it. It is highly unlikely that the most zealous birdwatcher would find such a nest, while it contains only eggs. Yet, for one with good hearing, the cries of its occupants cancelled the security provided for them by the parent who had prepared such a cunningly camouflaged abode. I have more than once been struck by the incongruity between the concealment of a nest, the excessive caution of the parents in approaching it, and the calls which they persistently uttered at the very time when they seemed fearful of betraying its position. I can only conclude that this careful concealment and circumspect approach are chiefly to protect the nest from predators which do not depend on hearing to locate their victims. Probably these predators are snakes, which take a heavy toll of eggs and nestlings from both low and high nests in the tropics.

In mid-July, I found a young male beginning to resemble the adult males, which were then in full nuptial plumage.

#### BLUE HONEYCREEPER

Since I have already published (1954) a life history of the Blue Honeycreeper (*Cyanerpes cyaneus*), I shall confine this account to certain observations made since that was written.

#### FOOD

The Blue Honeycreeper's fondness for the red arillate seeds of *Clusia* was mentioned in its life history (1954:389). But I did not realize how eager for this food the honeycreepers are until a tree of *C. rosea* (or a similar species), which sprang up spontaneously on a calabash tree in front of our house, began to fruit freely a few years ago. This robust *Clusia* with large, round, thick leaves bears a whitish pod about two and a half inches in diameter. These fruits mature in different months in different years. Usually, however, they mature between April and October, and the season of their abundance lasts for several months. The ripe pods spread out like stars with nine to 12 rays, or like flowers with as many pointed petals, exposing the brilliant seeds packed into an equal number of cells. The soft aril that surrounds each seed is, to me, tasteless in small amounts and distinctly bitter in large amounts, but to the birds it evidently tastes ambrosial.

The honeycreepers cannot wait for the valves to separate, but as soon as the first chink of expansion appears, they hang back downward beneath the pod and try to extract the seeds with their long black bills. Woodpeckers, especially the Golden-naped Woodpecker (*Tripsurus chrysauchen*), are equally fond of the *Clusia* seeds and, with their more powerful bills, are better able to remove them from fruits barely beginning

to dehisce. While the woodpeckers, hanging inverted, are so engaged, the honeycreepers gather around expectantly, waiting for the larger birds to leave. I several times saw Blue Honeycreepers, of both sexes, trying to intercept seeds which a parent Golden-nape was passing to a young woodpecker of a late brood, but as far as I could tell, its attempt to pilfer was unsuccessful. Green Honeycreepers and Shining Honeycreepers are equally fond of the seeds, but these birds are less numerous than the Blue Honeycreepers. When the tree is fruiting freely, some of these colorful birds are nearly always to be found flitting among its glossy leaves, and sometimes all three kinds are there together, along with the woodpeckers. The honeycreepers neglect sweet bananas, spread abundantly on a board in plain sight of them, while they compete keenly for these, to us, insipid or bitter arils. Meanwhile, the thick-billed tanagers, which could hardly compete with the sharp-billed birds for the contents of the *Clusia* pods, feed upon the more easily acquired fruit.

Not only the arillate seeds of *Clusia*, but those of other trees as well, are attractive to Blue Honeycreepers. Along with many tanagers, thrushes, wood warblers, vireos, orioles, American flycatchers, and manakins, they eat the red seeds of *Alchornea latifolia*, swallowing them whole, doubtless to digest the soft aril and later eject the undigested seed. Before the *Clusia* by our house spreads out its pods, a neighboring tree of *Dipterodendron elegans* sometimes ripens its fruits, and the honeycreepers eagerly devour the white arils of the shiny black seeds, neglecting the bananas for them. I recorded earlier (1954:389) their fondness for the thin, oily coat that encloses the bony seed of *Xanthoxylum*.

One December, when the supply of bananas and plantains for the birds' table was exhausted and I placed halved oranges on the board, Blue Honeycreepers often came to drink the juice. Sometimes, when a woodpecker drills through the rind of an orange or a tangerine, the honeycreepers wait until the larger bird leaves, then go to the hole and insert their long bills.

On several afternoons in April of 1953, I watched a Blue Honeycreeper cling to the rough bark of a flame-of-the-forest tree (*Spathodea campanulata*), sometimes beneath an ascending branch. Apparently the bird found insects or spiders in its crevices. Thus this species, like the Bananaquit (Skutch, 1954:406), sometimes engages, in a rudimentary fashion, in the activity suggested by the name "honeycreeper."

#### VOICE

In my earlier account of this honeycreeper, I described its extremely simple dawn song, which consists of the tireless reiteration of a single, weak, clear *tsip*, punctuated by the bird's rather nasal, mewing call, *cha*. On March 23, 1961, I heard a very different song, such as I had never before known a honeycreeper to utter. As I walked past the orange tree by the feeding shelf, a male Blue Honeycreeper flew into it, pursuing another small bird, evidently a female of his kind. He was singing a rapid, varied song, so low that it was barely audible a few yards away. This fleeting episode suggested that, latent in the honeycreepers, is the capacity to sing like other songbirds, although they neglect to develop it.

#### CONFLICTS

In my life history of the Blue Honeycreeper, I described (1954:391-393) a few of the many disputes that I had witnessed. These were always between two individuals of the same sex, either two males or two females, and they always consisted of calling and posturing without physical violence. In that account, I failed to mention the part played in these displays by the extensive pale yellow areas on the males' wings—areas which



are invisible while the wings are folded but conspicuous when they are spread in flight. While watching, in unusually favorable circumstances, a dispute between two males on the evening of June 5, 1960, I was impressed by the use made of these yellow patches. The scene of this controversy was about 20 feet up in a guava tree in front of my window, where the contestants, both in full breeding plumage, flitted restlessly from twig to twig among the foliage near the end of a branch. Despite their frequent changes of position, the birds were from a few inches to a foot apart most of the time and they nearly always faced each other, while they twitched their bodies sideward and upward and often elevated their bills. At the same time, they flitted their wings outward and upward, revealing flashes of yellow. One of the contestants often spread his wings rather widely, displaying a large expanse of yellow for a second or more. The other bird did not open his wings as far nor for so long. As they postured, both birds incessantly repeated their nasal *chaa*. This conflict lasted for about 20 minutes, during the greater part of which the birds remained among the twigs of the same bough, never touching each other. Toward the end, they moved more widely through the crown of the tree; then they separated. One uttered a number of weak, clear notes before he flew out of sight. No other Blue Honeycreeper was in view; and, as usual, I could not discover the cause of this altercation.

Although I have never seen two Blue Honeycreepers come to grips with each other, I once watched a female fight with a female Shining Honeycreeper. The date was May 22, 1958; the scene, the *Clusia* tree in front of the house, which the honeycreepers frequented for its red arillate seeds. The two females of different species clutched and fell earthward, but they separated before they reached the ground. Then one chased the other to a neighboring tree and then back to the *Clusia*. Here the Blue Honeycreeper postured and repeated her nasal *chaa*, while her yellow-legged adversary postured in silence. A male of each kind was present but took no part in the affray. Soon they all flew into the crown of a taller tree and, as far as I saw, quarreled no more.

I do not know whether Shining Honeycreepers, of which I have seen far less than of the Blue Honeycreepers, contend among themselves more strenuously than do the latter, but violent encounters are certainly rare in the honeycreeper family. Aside from this affray, I have only once seen a grappling fight among honeycreepers. The contestants in this instance were two Bananaquits, which seem to be wrongly included in this family, but which nearly always settle their differences by posturing and calling, in the manner of true honeycreepers. Although I earlier recorded instances of Green Honeycreepers, seizing other birds, I never saw one of them engage in a tussle; these seizures do not resemble the fights of any bird I know, and possibly their motivation is sexual. Yet the ability to fight seems to be latent in species of birds which one may watch for years without witnessing a violent encounter. I once believed that Song Tanagers, the most conspicuously abundant birds in this region where I have lived for a quarter of a century, never fought, but after stating this in print (1954:125) I saw a few grappling bouts between two males.

#### NESTING

Since writing the life history of the Blue Honeycreeper, I have watched two other females build their nests, and they did so without the male's help, as at all of the earlier nests that I studied. One female brought 16 billfuls of material to her nest from 7:56 to 8:56 a.m., which is somewhat more rapid building than I had recorded. Another female brought material nine times in the 25 minutes between 3:45 and 4:10 p.m. on April 1, 1958. This honeycreeper was incubating in her inaccessible nest by April 6, which is nearly two weeks earlier than I recorded in my book.

Since this book was published, Carvalho (1958) has watched a Blue Honeycreeper of the nominate race, *C. cyaneus cyaneus*, build a nest in Belém, state of Pará, Brazil. The female worked without her mate's help, and when completed her structure resembled the shallow, open cups of *C. cyaneus carneipes* found in Chiapas, México, by Alvarez del Toro (1952:18) and in Costa Rica by me. Hence it is most improbable that in British Guiana and Venezuela *cyaneus* constructs a deep pouch of blackish fibers with sideward-facing entrance at the top, utterly different from the shallow cups found both to the north and south of this region.

Indeed, I was from the first reluctant to admit that individuals of the same species built, even in widely separated parts of its range, the open cups found by me in Costa Rica and the deep purse ascribed to this honeycreeper in British Guiana by Beebe *et al.* (1917:241) and that these honeycreepers laid white, spotted eggs in the north but nearly black eggs in the south. But when I learned that pensile nests with black eggs had been attributed to the Blue Honeycreeper by the Penards (1910:475) in Surinam and, apparently independently, by Belcher and Smooker (1937:517-518) in Venezuela and Trinidad, I was constrained to recognize a case of geographical variation in nidification and egg color of which I know no parallel in other species.

But I should have preserved my scepticism. Apparently the Penard brothers, who from boyhood were confined to their home in Paramaribo by leprosy and relied on hunters, Indians, and others for their ornithological specimens, were misinformed by the untrained person who brought them the pouch-like nest with black eggs. Probably a hunter had shot the first bird that he found near this strange nest, which happened to be a Blue Honeycreeper pulling fibers from it for her own structure, as I have seen these birds do. Evidently Beebe, Belcher and Smooker, and others (see Eisenmann, 1953; Carvalho, 1958) identified their pouch-like nests with black eggs by reference to the erroneous published descriptions rather than by direct observation in the field.

I think it most improbable that the nest wrongly attributed to the Blue Honeycreeper belongs to the manakin, *Pipra aureola*, as Carvalho (1958) suggested. Neither the nest nor the egg remotely resembles those produced by other species of *Pipra* (for example, *P. coronata* and *P. mentalis*) nor of any other manakin that I know. I agree with Eisenmann (1953) that the identity of the remarkable black eggs remains a mystery. (Unfortunately, in my book [1954:396] Eisenmann's paper, reference to which was made in a paragraph inserted as the work was passing through the press, was wrongly cited, and the corresponding title was omitted from the list of Literature Cited.)

#### HONEYCREEPER FEEDS FLEDGLING TANAGER

In late April, 1958, my wife called my attention to a male Blue Honeycreeper which was giving a fledgling Song Tanager banana from the feeding shelf beside the house. In the next few days, we repeatedly saw the brilliant, silent foster parent feed the noisy adopted fledgling, twice his own size. While the tanager rested on a branch above the board, crying loudly and fluttering its wings, the honeycreeper carried up billful after billful of fruit to it. To deliver the food, the attendant stuck his long, sharp bill well into the mouth of the young bird, who evidently was annoyed or hurt by this mode of feeding which differed from that of its own parents, for after the edge was taken off its appetite it would turn and sidle away from the proffered food. Then the little honeycreeper would sometimes flit across the tanager's back and present the food from the other side. At times he did this repeatedly, presenting the billful to the fledgling alternately on its right and its left. When the tanager flew away without having accepted the last morsel, the honeycreeper followed, still bearing the food.

At other times, the tanager pursued its patient attendant through the garden, from

tree to tree and bough to bough, pleading with shrill cries and quivering wings whenever it came near him. Occasionally it received an insect which the honeycreeper caught in the foliage, in addition to fruit from the feeder. This honeycreeper was mated, and one evening I saw him perching close to a female high in a tree, with the young tanager resting near them. When the honeycreepers started on a high flight toward the river, the tanager followed; but soon it turned back, for Song Tanagers are not accustomed to fly as high and as far as do honeycreepers.

This young tanager was well able to feed itself; I saw it eating banana and likewise the small black berries of *Miconia* abundant at this season. Moreover, it was occasionally fed by an adult male Song Tanager, evidently its father. But it preferred the ministrations of the obliging honeycreeper to those of its own parent. One evening it flew away while the male Song Tanager was offering it fruit from the board, but a little later it was following its blue attendant once more. This strange association continued for at least four days.

#### PLUMAGE CHANGES

As reported earlier (1954:399-402), I was long puzzled by the male's changes in coloration. Certain observations suggested that adult males molted into a dull or "eclipse" plumage after the breeding season, but other observations cast doubt on this assumption. At least, it was evident that the schedule of plumage changes differed markedly in northern and in southern Central America. My first evidence that males do go into eclipse was provided by a bird that was feeding a fledgling with fruit in July, 1953. This male showed large areas of dull green on its blue and black body when I first noticed him, and he became increasingly greenish while he continued to feed the fledgling in the ensuing fortnight. On August 1 he was still attending the young bird, which now tried to eat banana by itself, although it was clumsy and mostly depended on the male for nourishment. The young bird attempted to eat a loose piece of bark that it plucked from a guava tree but soon let it drop.

Most male Blue Honeycreepers seem to finish their parental duties before they begin the postnuptial molt, and I have only one additional record of a male who started to go into eclipse plumage while still attending a fledgling. When I first noticed this parent at the feeding shelf on July 14, 1959, he had only a few inconspicuous pale feathers on his deep blue underparts, and the corners of his mouth were light. His postnuptial molt was just beginning and was considerably less advanced than that of the other adult males who frequented the board at this time. The fledgling whom he repeatedly fed could already help itself to plantain. For the next ten days, this young honeycreeper continued to accompany and to receive food from the male. I never saw a female feed the fledgling. In this interval, the light patches on the attendant male increased in area. On July 23 his body was still largely blue and black, although by this date other adult males were in full eclipse. Apparently, parental activities retard the postnuptial molt.

Since 1953, when I first obtained definite evidence that male Blue Honeycreepers go into eclipse, I have continued to make observations on their plumage changes, avoiding the confusion which my failure to distinguish the old males from the young brought into my earlier records. Here in El General, the first signs of the postnuptial molt of adult males, a few flecks of olive-green on the blue and black areas of the body, are commonly noticed in the last week of June or the beginning of July. In 1948, and again in the following year, I saw males on June 24 that might have been either juvenal or post-breeding. They had black-and-yellow remiges, but their bodies were largely or wholly greenish. Since I had noticed no earlier stages of the molt, I suspect that they had come from a distance, possibly from a lower altitude where breeding may begin

earlier. In recent years, I have seen no males, either adult or juvenal, in this condition at this date. After about July 10, males in full breeding plumage are no longer seen in this locality; all bear larger or smaller patches of greenish feathers, whose area increases as the weeks pass. In August, males in full eclipse plumage are common; few show much blue or black on their heads and bodies. Thereafter, these colors spread, until by mid-September, in some years, the most advanced males have fully regained their elegant nuptial attire. In October, the number of these brilliant birds increases.

The weather in the first quarter of the year seems to influence the course of these changes in coloration. In 1959, when the dry season was severe and prolonged, the molts came about two weeks later than in 1958, when frequent showers during this period prevented a severe drought. In 1958, no males in unblemished nuptial attire were noticed after the end of June, and on September 19 I saw a male that had fully recovered his breeding plumage. In the following dry year, however, the majority of the adult males were still in full nuptial plumage on July 5, and even those most advanced in the molt were then still largely blue and black. Correspondingly, I did not see a male that had fully recovered his nuptial dress until October 4. In 1960, when again showers during the early months of the year prevented the development of a severe dry season, a male had passed through the eclipse plumage and was in practically full breeding plumage by September 15.

Throughout the period of the eclipse, the adult males wear the black-and-yellow remiges of their breeding plumage. Whether these feathers are then replaced by similar ones, I am not sure; at least, they are not replaced by greenish remiges. Males hatched in the current year, which when full grown resemble females, begin about the end of June, in the most advanced individuals, to acquire the black-and-yellow remiges characteristic of adult males. In July and August, these young males in transitional plumage are readily distinguished from adult males in eclipse plumage by their possession of two kinds of remiges, the olive and the black-and-yellow; whereas the adults bear only one kind. Moreover, the heads and bodies of these young males are nearly or quite devoid of blue and black feathers, which do not begin to appear until the wing molt has been completed. In contrast, adults in eclipse plumage often show spots and small patches of these deeper colors.

I suspect that most of the males with green on their bodies after October, here in El General, are young birds rather than adults slow to regain their nuptial colors. Even by the end of January, some young males still retain a number of olive remiges, and these belated individuals do not show any traces of blue or black on their greenish bodies until February. By March, however, I have noticed no males that were not in full breeding plumage. Thus, in this region, all the males of whatever age, except those hatched in the current breeding season, seem to wear full nuptial attire through March, April, May, and most of June. From the end of June or early July until mid-September, no males in perfect breeding plumage are seen; all the adults are either entering eclipse, are in full eclipse, or are recovering from it.

In the Caribbean lowlands of Nicaragua, Howell (1957:101) found a male Blue Honeycreeper going into eclipse in mid-August. Observations which I made long ago (1954:399) suggest that in Guatemala the eclipse plumage is worn much longer than it is in Costa Rica, possibly until December or January. As mentioned elsewhere, Green Honeycreepers, Turquoise Dacnises, and Shining Honeycreepers come to my feeding shelf in full breeding plumage throughout the year, even while Blue Honeycreepers are in eclipse. Apparently the Blue Honeycreeper is the only member of its family in Central America which undergoes this seasonal change in coloration which is so rare among the passerines of the humid tropics of America.

## SHINING HONEYCREEPER

The elegant Shining Honeycreeper (*Cyanerpes lucidus*) which in earlier publications I have referred to incidentally as the "Hyacinthine Honeycreeper," is four inches in length. The male's head and body are nearly everywhere plain dull ultramarine, with a black patch covering his lores, chin, and throat. His wings, tail, and thighs are likewise black. His bill is black and his eyes dark, but his legs and toes are intensely yellow. In the female, the upper plumage is dull grass green, becoming bluish on the top of the head. Her throat is buff and her central underparts are whitish, conspicuously streaked with blue on the chest; her sides and flanks are grayish green. Her bill is black, her eyes dark, and her legs and toes greenish yellow.

This species is closely related to, if not conspecific with, the Yellow-legged Honeycreeper (*C. caeruleus*) of South America. It ranges from extreme southern México to northwestern Colombia. In northern Central America it is confined to the Caribbean side; but in Costa Rica and Panamá, it occurs also on the Pacific slope. In Costa Rica, it has been recorded from both coasts to the vicinity of San José in the Central Plateau at about 4000 feet above sea level, but it is now evidently rare or absent in this intensively cultivated region. In my experience, it is the rarest of the Costa Rican honeycreepers, and I have found it only on and near our farm at Quizarrá in the valley of El General, at about 2500 feet above sea level. Here it is unusual to see more than a single pair at the forest's edge or in neighboring clearings with scattered trees. It is present at all seasons and breeds in this area, although its nest has escaped me. I saw a female feed a fledgling by our house on September 30, 1960. In the Caribbean lowlands, it is reported to be seasonally abundant, especially from May to September (Slud, 1960:109).

A long series of wet, gloomy days in the second half of October, 1944, brought birds of many kinds to my feeding shelf in such numbers that I was kept busy putting out bananas for them. On the first of November, rain fell moderately from dawn to evening, and there was no sunshine. But the day was brightened for me by the appearance on the feeding tray of the first Shining Honeycreeper that I had ever seen there. This bird's deep blue and its yellow instead of red legs readily distinguished it from the Blue Honeycreepers that crowded around it.

In the ensuing months, I saw this honeycreeper or another like it at long intervals. Finally, on March 24 of the following year, it came with a mate, and for several minutes they stood side by side, eating plantains. I hoped that they would breed in the garden, but they soon vanished and I saw no more Shining Honeycreepers until the following October, when another spell of inclement weather brought a male to the feeding shelf. In the succeeding years, they have been irregular attendants, coming for banana or plantain chiefly in the period of heavy rains following the autumnal equinox.

Like other honeycreepers, this species is fond of arillate seeds, including those of *Clusia* and *Dipterodendron*. I have already recorded an encounter between a female Shining Honeycreeper and a female Blue Honeycreeper in the *Clusia* tree where they competed for the red seeds (see p. 108). Shining Honeycreepers also search for spiders and insects on slender dead twigs well up in the trees, and they investigate small, curled, dead leaves.

Like other members of its family, the Shining Honeycreeper is a silent bird. I have only one record of its voice. As I was passing through light second-growth woods late in the afternoon of September 5, 1947, I noticed a male Shining Honeycreeper perching on a thin, dead twig at the very top of a tall *Inga* tree. He was visible against an overcast sky from which a fine drizzle was descending. He was repeating a weak note which drew my attention to him, and for the next 15 minutes he continued to deliver this same note at the rate of about once a second, in the most monotonous fashion. After perform-

ing for some minutes on this exposed perch, he flew to a neighboring tree where I lost sight of him, but he continued to repeat his slight notes in exactly the same fashion as before. For a while, a female of his kind rested in the top of the *Inga* tree several yards away from him, but she flew off before he was halfway through his song. His song somewhat resembled the dawn song of the Blue Honeycreeper but was simpler, consisting of a single kind of note instead of two kinds. It was surprising to hear such a performance so late in the day.

This Shining Honeycreeper was in full nuptial attire, as I have found males of this species to be at all seasons.

#### THE CLASSIFICATION OF HONEYCREEPERS AND THEIR ALLIES

The three genera of honeycreepers treated in this paper, *Chlorophanes*, *Dacnis*, and *Cyanerpes*, exhibit many resemblances in behavior and in morphology. All are small, slender-billed birds, the males of which are brilliantly colored. The females are far more modestly attired. Internally, these honeycreepers agree in having a small crop, fringed tongue, and simple intestinal convolutions (Ridgway, 1902:376). They have likewise similar patterns of the jaw muscles and sculpture of the horny palate (Beecher, 1951). All are fond of bananas and other fruits but seem to prefer, above all, the arils surrounding the seeds of certain trees. Nectar, which they extract from flowers, appears to form a subordinate part of their diet. They also capture many small insects amid the foliage of trees. All are silent birds; they are either songless or have extremely simple songs which they use very sparingly. Nuptial feeding occurs in the Turquoise *Dacnis* and the Green Honeycreeper but apparently not in the Blue Honeycreeper. All of these honeycreepers settle their quarrels by posturing and calling; they never fight with other individuals of the same species, as far as known. The slight open nests, usually placed high in trees, are built by the females; the males attend but do not help their mates. Only the female incubates, but both sexes feed the nestlings with food carried in the bill, mouth, and throat. Food is not regurgitated. The male often brings less food than the female. The interior of the nestling's mouth is red. The incubation period, as far as known, is 12 or 13 days, and the nestling period is 13 or 14 days.

In a number of these characteristics, these three genera of honeycreepers resemble the tanagers. Many of the latter exhibit striking sexual differences in plumage, although in numerous brilliant species males and females are nearly or quite alike. Tanagers subsist largely on fruits, and if they eat fewer arillate seeds than do the honeycreepers, the reason may be that their short bills are poorly fitted for extracting these seeds from certain kinds of fruits. In the brilliant genus *Tangara*, song is poorly developed and seems to be lacking in some species. Although I have lived for many years surrounded by tanagers of numerous kinds, I have only on the rarest occasions seen them fight, and then but briefly. Nuptial feeding occurs in several genera. Tanagers' nests are usually open, like those of honeycreepers, but they are often built by both sexes. Only the female incubates, but both sexes feed the young with food carried in the bill, except in *Euphonia* and *Chlorophonia*. (The latter build roofed nests and regurgitate food to the young.) The interior of the nestling's mouth is red.

Although I agree with Beecher that these genera of honeycreepers are closely allied to, and apparently derived from, the tanagers, I doubt the wisdom of including them (and other honeycreepers which resemble them) in the Thraupidae, thereby increasing the heterogeneity of this already large family of birds. A system of classification should not only indicate the relationship of organisms but also aid us in identifying and discussing them. This second purpose of classification is defeated by making genera and families too heterogeneous. After all, as certain members of a group continue to diverge

from the original stock, they reach a point where they must be recognized as constituting another group of coordinate rank. Hence I propose that these three genera, along with any others which may be found sufficiently to resemble them in structure and behavior, be set apart as a distinct family, the honeycreepers. Since, for reasons which I shall presently enumerate, *Coereba* does not belong in this family, probably the family should be known as the Dacnidae, since the generic name *Dacnis*, published by Cuvier in 1817, is older than *Chlorophanes* and *Cyanerpes*.

I further agree with Beecher that the Bananaquit, *Coereba*, is not closely allied to the foregoing genera. In addition to anatomical differences which others have pointed out (Ridgway, 1902; Beecher, 1951), this genus differs from the true honeycreepers in a number of characteristics which impress the field naturalist: the plumage pattern is warbler-like rather than tanager-like; the male is not brilliantly colored and the sexes are alike; it seeks nectar far more persistently than do the dacnids but neglects fruits and arillate seeds (the Bananaquits, abundant in our garden, rarely visit the feeding shelf for banana or plantain, and when they come they seldom do more than taste the fruit or sip moisture from it); the male incessantly repeats his simple song; the relatively bulky nest is covered, with a doorway that faces obliquely downward, and when used for breeding instead of only as a dormitory, it is built by both sexes; the downless nestlings are fed by regurgitation; like other nestlings of diverse families that are so nourished, a dilatation of the esophagus produces a conspicuous swelling on one side of the neck when it is filled with rapidly delivered food. It is difficult to remove young Bananaquits from their nest without injuring them or their abode. Although older nestlings seemed to have yellow mouths when I watched them through binoculars as they were fed, in two broods which I have more closely examined, the interior of the mouth was red.

In this last character *Coereba* resembles the dacnids and tanagers, and it also resembles the former in that the male parent feeds the nestlings considerably less often than the female (Biaggi, 1955). Biaggi saw physical combats between Bananaquits in Puerto Rico and believed that this behavior set them apart from the wood warblers, in which family such combats are "not so common." In Costa Rica, however, Bananaquits settle their differences by posturing and vocalization, as do the Blue Honeycreepers, although their disputes are less spectacular. As was stated earlier, I have only once seen two Bananaquits clinched in a fight. In many tropical wood warblers the sexes are alike, as in the Bananaquit, and some of them build covered nests. But the doorway of these nests faces sideward rather than downward and the nests are generally placed on the ground rather than in bushes and trees. Despite certain resemblances between *Coereba* and the wood warblers, there are differences which, in my opinion, are sufficient to keep it separate from that family. Among them are the form of the bill and tongue, the nidification and sleeping habits, and the red instead of yellow interior of the nestlings' mouths. Mouth color is a conservative character which is apparently little subject to adaptive change.

There remains the question of how to classify certain other genera that have been included in the Coerebidae, and the position of *Diglossa* is especially puzzling. Some species of these small highland birds (for example, *D. cyanea*) are almost as brilliant as true honeycreepers, but many species are far more plainly clad. Also the females are duller than the males. *Diglossa* seeks nectar as persistently as *Coereba* but extracts it from the flowers by a very different method. It regularly pierces the base of the corolla with its highly modified bill instead of only occasionally doing so with a much less modified bill, as in *Coereba*. In songfulness, both Central American and Andean flower-piercers resemble the voluble Bananaquit rather than the silent honeycreepers, and

the songs of *Diglossa* and *Coereba* are somewhat similar. Like the true honeycreepers, *Diglossa* builds an open nest, but one that is far more substantial. Perhaps this is an adaptation to the cooler climate in which it dwells. Nestlings are fed by regurgitation, and the interior of the mouth is red.

Thus, if we break up the old family Coerebidae, it is by no means obvious whether *Diglossa* should be placed with the Bananaquit or with the dacnids; reasons can be adduced for placing it with either division. Ridgway (1902:377) was "strongly tempted to separate, as a distinct family, the genera *Diglossa* and *Diglossopsis*, on account of the peculiar and very remarkable modification of the basal portion of the mandible." My observations of the living birds lead me to approve this procedure suggested by Ridgway in consequence of his study of museum specimens. If we proceed to split into more homogeneous groups the heterogeneous assemblage of birds once included in the Coerebidae, let us carry our dismemberment to its logical conclusion. Just as it has been found advisable to separate the vireo-like birds into the large family Vireonidae and the two small families Vireolaniidae and Cyclarhidae, so it may be well to divide the honey-creeper-like birds into the families Dacnidae or true honeycreepers, Diglossidae or flower-piercers and their allies, and Coerebidae or bananaquits and their close relatives. We must, however, await further studies before all the genera once included in the Coerebidae can be properly allocated.

#### SUMMARY

This paper contains life histories of the Green Honeycreeper and the Turquoise Dacnis, an account of the apparently hitherto undescribed nest of the Scarlet-thighed Dacnis, new observations on the Blue Honeycreeper, and notes on the Shining Honeycreeper.

These honeycreepers appear to prefer arillate seeds, especially those of *Clusia*, above all other foods. They eat a variety of fruits, and nectar is a minor element in their diet.

Nuptial feeding was observed in the Green Honeycreeper (away from the nest) and in the Turquoise Dacnis (while the female built and incubated). It seems not to have been hitherto reported for the family.

Anting was repeatedly observed in the Green Honeycreeper. This act was always performed in trees.

Voice is poorly developed in these honeycreepers, but very simple "songs" are given by the Turquoise Dacnis and the Blue Honeycreeper. In the latter, a low, animated song was heard once.

Disputes are settled by calling and posturing, and intraspecific fights are unknown. Male Green Honeycreepers sometimes seize their mates or small birds of other kinds firmly by the tail, wing, or leg, but this does not result in a fight.

The small open nests of these honeycreepers are built by the female; the male follows the female but does not help build. The nest of the Green Honeycreeper contains many relatively large, dead leaves. The nest of the Scarlet-thighed Dacnis is completely covered below by living pieces of fern. The blackish, pensile pouches that have been attributed to the Blue Honeycreeper are made by some other, unknown, bird.

Incubation is performed only by the female and, in the Green and Blue honeycreepers, it lasts for 12 or 13 days.

Anticipatory food-bringing was observed in the Turquoise Dacnis.

The nestlings are fed by both parents, with food carried in the bill, mouth or throat. Food is not regurgitated. The female usually feeds more often than the male. A single nestling Turquoise Dacnis was fed by two males in full nuptial plumage, one of whom seemed to be an unmated helper rather than a second mate of the female parent. The young leave the nest when 13 or 14 days old.



A male Blue Honeycreeper repeatedly fed a fledgling Song Tanager.

As previously reported, adult male Blue Honeycreepers go into "eclipse" after the breeding season. A second instance of a male becoming progressively greener while attending a fledgling is here recorded. In El General, Costa Rica, no male in full nuptial attire has been seen from late June or early July until about the middle of September. Only in March, April, May, and early June are all the males, except those hatched in the current breeding season, in full nuptial plumage.

The Coerebidae is a heterogeneous family, some of whose members appear to have been derived from the tanagers. If dismembered, it should be divided into three families, the Dacnidae or true honeycreepers, the Diglossidae or flower-piercers, and the Coerebidae or bananaquits.

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